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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/817,473	03/26/2001	Yi Xu	CS98-106/7/8C	1603

28112 7590 08/30/2005

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EXAMINER	
NGUYEN, THANH T	
ART UNIT	**PAPER NUMBER**
2813	

DATE MAILED: 08/30/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/817,473	XU ET AL.	
	Examiner	Art Unit	
	Thanh T. Nguyen	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 August 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *15,23 and 27* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *23-25 and 27* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments, see amendment, filed 8/10/05, with respect to the rejection(s)of claim(s) 23-27 under 35 USC § 103 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Yang et al. (U.S. Patent No. 6,162,583).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 23-25, 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yang et al. (U.S. Patent No. 6,162,583) in view of You et al. (U.S. Patent No. 6,197,703).

Referring to figures 6, Yang et al. teaches a method for fabricating multilevel metal interconnections having low dielectric constant insulators on a substrate comprising the steps of:
providing first metal lines (14) , formed over said substrate (12);
coating a layer of low dielectric constant insulating material (16) on and in between said metal lines;

curing the low dielectric constant material;

depositing by plasma enhanced chemical vapor deposition a layer of silicon nitride (18, see figure 6, col. 5, lines 55-65), an adhesion promoter and stabilizing material, to a thickness of between approximately 200 to 500 Angstrom, on the low dielectric constant material (Noted that the same material, the same deposition process, and the same thickness range would provide the same function as adhesion promoter and stabilizer);

depositing by plasma enhanced chemical vapor deposition a silicon oxide cap layer (20) on the adhesion promoter and over the low dielectric constant material (see col. 5, lines 65-67); and planarizing the silicon oxide cap layer by chemical mechanical polish (CMP) (see col. 6, lines 1-4).

25. layer of adhesion promoter and stabilizer is a non-oxide compound, comprised of SiN, SiC, BC, BCN, BN, or spun on compounds (see col. 5, lines 55-62).

27. silicon oxide cap layer is deposited by plasma enhanced chemical vapor deposition, to a thickness of between about 4,000 to 16,000 Angstroms (see col. 6, lines 1-4).

However, Yang et al. does not teach low dielectric constant material is curing condition 400°C for l hr in a nitrogen ambient gas flow from about 1 to 30 SLM, oxygen less than 10 ppm. Nevertheless, such processing steps are known in the semiconductor processing art as evidenced by You et al. You et al. teaches forming a low dielectric constant material layer HSQ (24, see figure 1), which is a spin-on dielectric layer, and curing the low dielectric constant material layer HSQ (24) by baking in an oven in an inert gas (which includes nitrogen gas) ambient at 400°C for an hour (see col. 5, lines 10-21).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to cure the low dielectric constant layer in a nitrogen gas ambient in Yang et al.'s process as taught by You et al. ***because*** curing the low dielectric constant material layer HSQ at 400°C for 1 hr., in a nitrogen gas ambient would form a layer of low dielectric constant material layer containing lower moisture/solvent in the material, therefore, it increases the adhesion strength when overlying layer is formed on the surface, and it also improves the surface uniformity and planarization.

It is would also have been obvious to a person of ordinary skill in the art at the time the invention was made that there is no oxygen in the inert gas ambient or vacuum because You et al. teaches curing the low dielectric constant material layer HSQ in an inert gas ambient or vacuum (see col. 5, lines 16-18), therefore, the oxygen content must be less than 10 ppm in an inert gas ambient or vacuum (as required by claim 24).

The specific gas flow range of the nitrogen gas as claimed are taken to be obvious since these are variables of art recognized importance which are subject to routine experimentation and optimization and discovery of an optimum value for a known process is obvious. In re Aller, 105 USPQ 233 (CCPA 1955). And, even if applicants' modification results in great improvement and utility over the prior art, it may still not be patentable if the modification was within the capabilities of one skilled in the art, In Re Sola 25 USPQ 433.

Therefore, one of ordinary skill in the requisite art at the time the invention was made would have used specific nitrogen gas flow range to cure the HSQ low dielectric constant material which has a thickness of 2000-12000 angstroms (see col. 5, lines 46-54 of Yang et al. '186) ***because*** using specific nitrogen flow rate would decrease the drying time for the solvent in

the HSQ material layer to evaporate out of the material, and with the combination of specific nitrogen gas flow rate, film thickness and curing temperature could also cause the HSQ material to reflow and filling the wafer's channel.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh Nguyen whose telephone number is (571) 272-1695, or by Email via address Thanh.Nguyen@uspto.gov. The examiner can normally be reached on Monday-Thursday from 6:00AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, can be reached on (571) 272-1702. The fax phone number for this Group is (571) 273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956 (**See MPEP 203.08**).

Thanh Nguyen
Patent Examiner
Patent Examining Group 2800

TTN